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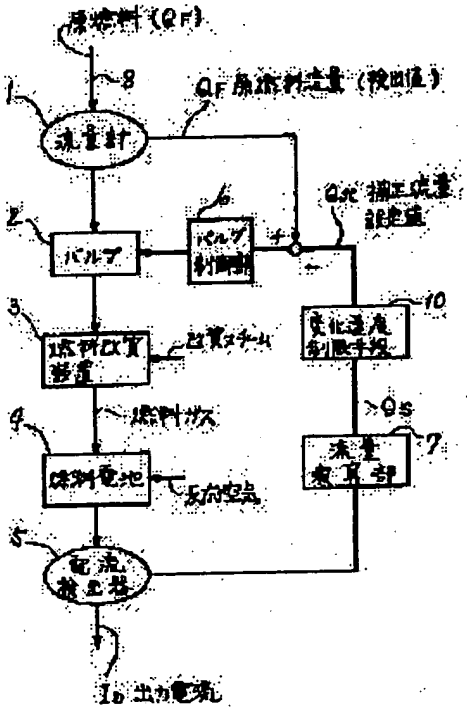
(54) RAW FUEL FLOW RATE CONTROLLER FOR FUEL CELL GENERATOR UNIT

(57)Abstract:
PROBLEM TO BE SOLVED: To provide a raw fuel flow rate controller capable of preventing undershooting of a raw fuel flow rate at the time of an abrupt decrease in fuel cell output current and avoiding generation of gas shortage.
SOLUTION: A raw fuel flow rate controller comprises: a flow meter 1 and a control valve 2, which are disposed in a raw fuel supply system 8 for a fuel cell generator unit having a fuel reformer 3 and a fuel cell 4; a current detector 5 disposed on an output side of the fuel cell; a flow rate arithmetic part 7 for calculating and outputting a flow rate set value QS of raw fuel corresponding to a current value detected by the current detector; a valve controller 6 for controlling an opening degree of a control valve in such a manner that a raw fuel flow rate QF follows the flow rate set value QS; and change speed limiting means 10 for judging a change in flow rate set value output from the flow rate calculator so as to output a correct flow rate set value QSt, a reduced rate of which is alleviated at the time of an abrupt decrease in flow rate set value while to output the flow rate set value QS as it is at the time of an increase in flow rate set value.



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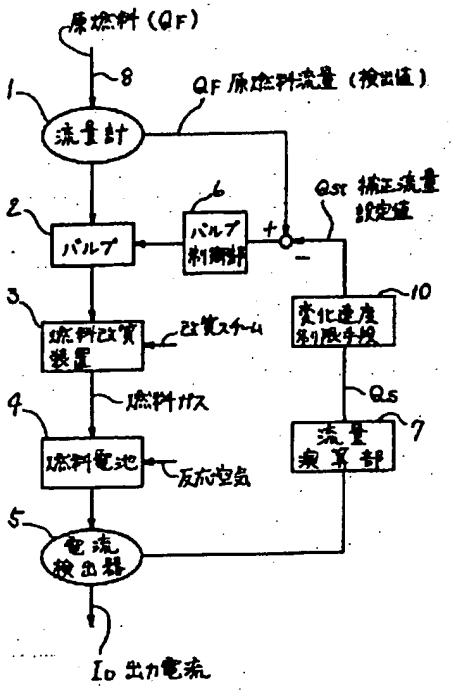
(54)【発明の名称】　燃料電池発電装置の原燃料流量制御装置

(57)【要約】
【課題】燃料電池出力電流の急減時における原燃料流量のアンダーシュートを防ぎ、ガス欠状態の発生を回避できる原燃料流量制御装置を提供する。
【解決手段】燃料改質装置３および燃料電池４を有する燃料電池発電装置の原燃料の供給系８に設けた流量計１および制御バルブ２と、燃料電池の出力側に設けた電流検出器５と、この電流検出器が検出した電流値に相応した原燃料の流量設定値Q_Sを演算して出力する流量演算部７と、原燃料流量Q_Fを流量設定値Q_Fに追従するよう制御バルブの開度を制御するバルブ制御部６を備えた原燃料流量制御装置が、流量演算部の出力流量設定値の増減を判別して、流量設定値の急減時にはその減少速度を緩和した補正流量設定値Q_{S1}を出力し、流量設定値の増加時には減速しない流量設定値Q_Sをそのまま出力する変化速度制限手段１０を備える。



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【特許請求の範囲】

【請求項１】原燃料の供給系から供給される原燃料を水素リッチな燃料ガスに改質する燃料改質装置、および前記燃料ガスを受けて発電する燃料電池を有する燃料電池発電装置の前記原燃料の供給系に設けた流量計および制御バルブと、前記燃料電池の出力側に設けた電流検出器と、この電流検出器の検出値に相応した前記原燃料の流量設定値を演算して出力する流量演算部と、前記流量計の検出流量が前記原燃料の流量設定値に一致するよう前記制御バルブの開度を制御するバルブ制御部とからなり、前記燃料電池の出力電流に応じて前記原燃料の供給量を制御する原燃料流量制御装置において、前記流量演算部の出力流量設定値の増減を判別して、流量設定値の急減時にはその減少速度を緩和した補正流量設定値を出力し、前記流量設定値の増加時には減速しない流量設定値をそのまま出力する変化速度制限手段を備えたことを特徴とする燃料電池発電装置の原燃料流量制御装置。

【請求項２】請求項１に記載の燃料電池発電装置の原燃料流量制御装置において、変化速度制限手段が流量設定値の増加または減少を判別する増減判別部と、この増減判別部が流量設定値の増加を検知したとき動作して減速しない流量設定値をそのまま出力する流量増加設定値の出力部と、前記増減判別部が流量設定値の急減を検知したとき動作して減少速度を緩和した補正流量設定値を出力する減少速度低減部とを備えたことを特徴とする燃料電池発電装置の原燃料流量制御装置。

【発明の詳細な説明】

【０００１】

【発明の属する技術分野】この発明は、燃料電池発電装置における燃料改質装置への原燃料流量の制御装置に関する。

【０００２】

【従来の技術】図５は燃料電池発電装置の従来の原燃料流量制御装置を簡略化して示すシステム構成図である。図において、燃料改質装置３は天然ガスなどの原燃料と改質スチームとの混合ガスを水蒸気改質により水素リッチな燃料ガスに改質して燃料電池４に供給する。燃料電池４はその燃料極に供給される燃料ガスと空気極に供給される反応空気との電気化学反応に基づく発電により直流電流を出力する。このように構成された燃料電池発電装置の原燃料流量制御装置は、原燃料供給系８に設けた流量計１および制御バルブ２と、燃料電池４の出力側に設けた電流検出器５と、電流検出器５で検出した燃料電池出力電流I_Dに相応した原燃料の流量設定値Q_Sを演算して出力する流量演算部７と、流量計で検出した原燃料流量Q_Fが原燃料の流量設定値Q_Sに追従するよう制御バルブ２の開度を制御するバルブ制御部６とで構成され、燃料電池４の出力電流I_Dに追従して原燃料の供給量Q_Fを制御するよう構成される。

【０００３】ところで、燃料電池４の出力電流I_Dの制

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御は外部負荷指令により図示しない電力変換器を制御する方式が用いられるが、外部負荷指令により出力電流I_Dの急増が指令された場合、燃料電池１は遅滞なく出力電流I_Dを急増しようとするのに対し、物質の移動および化学反応を伴う燃料改質装置３の応答が遅いために燃料ガスの供給に遅れが生じ、燃料電池４に過渡的に燃料ガスの不足状態（ガス欠状態）が発生する。また、この状態で燃料電池を運転した場合には、電極触媒粒子が粗大化するなどの劣化現象が発生し、これが原因で燃料電池の発電性能および寿命特性の低下を招くという問題が発生する。

【０００４】このような劣化現象を防ぐために、従来の原燃料流量制御装置では流量演算部７に一次式を用い、原燃料の流量設定値Q_Sを燃料電池出力電流I_Dの変化に即応して変化させることにより、燃料電池出力電流I_Dの急増に追従して原燃料流量Q_Fが変化するよう構成されている。また、燃料電池出力電流I_Dが急増したときに燃料ガスが不足しないように原燃料流量設定値Q_Sを予め増加しておく補正を加えたり、燃料電池出力電流I_Dを素早く低下させる手段を設けたりする提案が本願と同一出願人等により提案されている（特願平６－９９３９７号参照）。

【０００５】

【発明が解決しようとする課題】図６は図５に示す従来の原燃料流量制御装置における出力電流急減時の動作を模式化して示す特性線図である。図において、燃料電池出力電流I_DがＡレベルからＢレベルに急減すると、これに比例して流量演算部７が出力する原燃料の流量設定値Q_Sも急減し、この変化を検知したバルブ制御部６は流量計の検出流量Q_Fが原燃料の流量設定値Q_Sに追従するよう制御バルブ２の開度を制御する指令を発する。ところが、制御バルブ２の動作が流量設定値Q_Sの急減に追従できないために、原燃料流量Q_Fにアンダーシュートが発生し、これが原因で燃料電池４に過渡的にガス欠状態が生ずるため、電極触媒粒子が粗大化するなどの劣化現象や、燃料電池の寿命特性の低下を完全には回避できないという、従来技術では気付かない問題点があることが判明した。

【０００６】この発明の課題は、燃料電池出力電流の急減時における原燃料流量のアンダーシュートを防ぎ、ガス欠状態の発生を回避できる原燃料流量制御装置を提供することにある。

【０００７】

【課題を解決するための手段】前述の課題を解決するために、請求項１に記載の発明は、原燃料の供給系から供給される原燃料を水素リッチな燃料ガスに改質する燃料改質装置、および前記燃料ガスを受けて発電する燃料電池を有する燃料電池発電装置の前記原燃料の供給系に設けた流量計および制御バルブと、前記燃料電池の出力側に設けた電流検出器と、この電流検出器の検出値に相応

した前記原燃料の流量設定値を演算して出力する流量演算部と、前記流量計の検出流量が前記原燃料の流量設定値に一致するよう前記制御バルブの開度を制御するバルブ制御部とからなり、前記燃料電池の出力電流に応じて前記原燃料の供給量を制御する原燃料流量制御装置において、前記流量演算部の出力流量設定値の増減を判別して、流量設定値の急減時にはその減少速度を緩和した補正流量設定値を出力し、前記流量設定値の増加時には減速しない流量設定値をそのまま出力する変化速度制限手段を備える。

【０００８】ここで、請求項２に記載の発明は、請求項１に記載の燃料電池発電装置の原燃料流量制御装置において、変化速度制限手段を流量設定値の増加または減少を判別する増減判別部と、この増減判別部が流量設定値の急増を検知したとき動作して減速しない流量設定値をそのまま出力する流量増加設定値の出力部と、前記増減判別部が流量設定値の急減を検知したとき動作して減少速度を緩和した補正流量設定値を出力する減少速度低減部とを備えるよう構成すると好便である。

【０００９】請求項１に記載の発明では、変化速度制限手段が流量演算部の出力流量設定値の急減時に、その減少速度を緩和した補正流量設定値を出力するので、例えばその減少速度を制御弁動作が追従できる程度に緩和することにより、原燃料流量のアンダーシュートを防止することが可能になり、原燃料流量のアンダーシュートが原因で燃料電池に発生するガス欠状態が回避される。また、流量設定値の増加時には変化速度制限手段が減速しない流量設定値をそのまま出力するので、原燃料流量を流量設定値に比例して急増させることが可能となり、ガス欠を防止する作用が得られる。

【００１０】ここで請求項２に記載の発明では、増減判別部が流量設定値の急増を検知したとき、流量増加設定値の出力部が動作して減速しない流量設定値をそのまま出力し、増減判別部が流量設定値の急減を検知したとき減少速度低減部が動作して減少速度を緩和した補正流量設定値を出力するので、原燃料流量のアンダーシュートを防止する作用と、原燃料流量を流量設定値に追従して急増させる作用とが容易に得られる。

【００１１】

【発明の実施の形態】以下この発明を実施例に基づいて説明する。なお、従来例と同じ参照符号を付けた部材は従来例のそれと同じ機能をもつので、その説明を省略する。図１は請求項１に記載の発明の一実施例を示す燃料電池発電装置の原燃料流量制御装置の簡略化したシステム構成図である。図において、原燃料流量制御装置は電流検出器５で検出した燃料電池出力電流I_Dに相応した原燃料の流量設定値Q_Sを演算して出力する流量演算部７の出力側に変化速度制限手段１０を備え、流量設定値Q_Sの急減時にはその減少速度を緩和した補正流量設定値Q_{St}を出力し、流量設定値Q_Sの増加時には減速しない流量設定値Q_Sをそのまま出力する。したがって、例えば補正流量設定値Q_{St}の減少速度を制御弁２の動作が追従できる程度に緩和しておくことにより、従来技術で問題になった原燃料流量Q_Fのアンダーシュートを防止することが可能になり、原燃料流量のアンダーシュートが原因で燃料電池４に発生するガス欠状態が回避される。また、流量設定値Q_Sの増加時には変化速度制限手段１０が減速しない流量設定値Q_Sをそのまま出力するので、原燃料流量Q_Fを流量設定値Q_Sおよび燃料電池出力電流I_Dの変化に比例して急増させる制御弁２の開度制御が可能となり、出力電流急増時におけるガス欠状態をも防止することが可能になる。

【００１２】図２は請求項２に記載の発明の一実施例を示す変化速度制限手段の簡略化した構成図である。図において、変化速度制限手段は、流量演算部７が出力する流量設定値Q_Sの増加または減少を判別する増減判別部１１と、この増減判別部１１が流量設定値の急増を検知して出力する信号により動作して減速しない流量設定値Q_Sをそのまま出力する流量増加設定値の出力部１２と、増減判別部１１が流量設定値の急減を検知して出力する信号により動作して減少速度を緩和した補正流量設定値Q_{St}を出力する減少速度低減部１３とで構成される。

【００１３】図３は図２に示す実施例における減少速度低減部の動作を模式化して示す特性線図である。図において、流量演算部７が燃料電池出力電流I_Dの急減を検知してQ_{SA}からQ_{SB}に急減する流量設定値$Q_{S(A-B)}$を出力したと仮定する。このとき減少速度低減部１３は流量設定値$Q_{S(A-B)}$を制御弁２の追従可能速度によって決まる緩和時間T_Dで除した減少速度で低下する補正流量設定値Q_{St}を出力する。これを受けたバルブ制御部６は流量計で検出した原燃料流量Q_Fが原燃料の補正流量設定値Q_{St}に追従するよう制御バルブ２の開度を制御するので、原燃料流量Q_Fのアンダーシュートは排除され、これに起因する燃料電池４のガス欠状態が回避され、電極触媒粒子が粗大化するなどの劣化現象の発生や、燃料電池の寿命特性の低下などの悪影響が排除される。

【００１４】図４は請求項２に記載の発明の異なる実施例を示す流れ図であり、変化速度制限手段が演算処理回路として構成された場合を例に示してある。図において、ステップ２１で流量演算部７が出力する流量設定値Q_Sが流量の急減を指示していない場合、ステップ２２により流量設定値Q_Sと等しい減速しない補正流量設定値Q_{St}が出力される。流量設定値Q_Sが流量の急減を指示した場合、ステップ２３でタイマーがカウントを開始し、ステップ２５で減少速度$Q_{S(A-B)}/T_D$で減少する補正流量設定値Q_{St}が出力され、$Q_{St} \geqq Q_{SB}$、またはタイマー$\leqq T_D$なる条件に到達するまで補正流量設定値Q_{St}が更新される。

【００１５】

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【発明の効果】この発明は前述のように、原燃料の流量演算部が出力する流量設定値が急減したとき、その減少速度を緩和して出力する変化速度制限手段を設けるよう構成した。その結果、従来の原燃料流量制御装置で問題になった原燃料流量のアンダーシュートが排除され、このアンダーシュートに起因して燃料電池に発生するガス欠状態が回避されるので、ガス欠状態に起因して燃料電池に生ずる発電性能や寿命特性の低下を排除できる原燃料流量制御装置を備えた燃料電池発電装置を提供することができる。

【図面の簡単な説明】

【図１】請求項１に記載の発明の一実施例を示す燃料電池発電装置の原燃料流量制御装置の簡略化したシステム構成図

【図２】請求項２に記載の発明の一実施例を示す変化速度制限手段の構成図

【図３】図２に示す実施例における減少速度低減部の動

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作を模式化して示す特性線図

【図４】請求項２に記載の発明の異なる実施例を示す流れ図

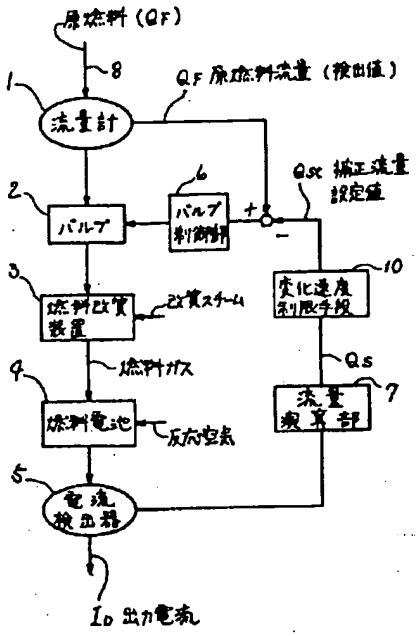
【図５】燃料電池発電装置の従来の原燃料流量制御装置を簡略化して示すシステム構成図

【図６】図５に示す従来の原燃料流量制御装置における出力電流急減時の動作を模式化して示す特性線図

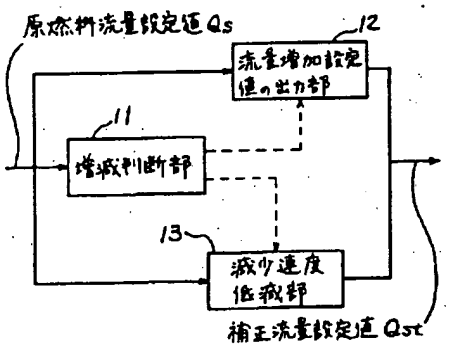
【符号の説明】

１・・・流量計、２・・・制御バルブ、３・・・燃料改質装置、４・・・燃料電池、５・・・電流検出器、６・・・バルブ制御部、７・・・流量演算部、８・・・原燃料供給系、１０・・・変化速度制限手段、１１・・・増減判断部、１２・・・流量増加設定値の出力部、１３・・・減少速度低減部、Q_S ・・・流量設定値、Q_F ・・・原燃料流量（実際値）、Q_{St} ・・・補正流量設定値、I_D ・・・燃料電池出力電流、T_D ・・・緩和時間。

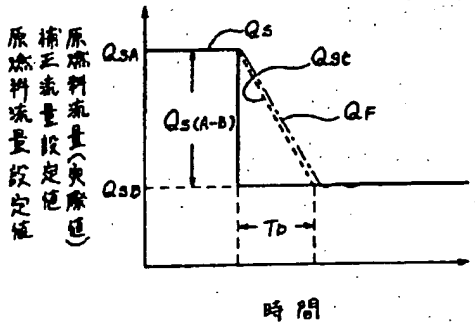
【図１】



【図２】



【図３】



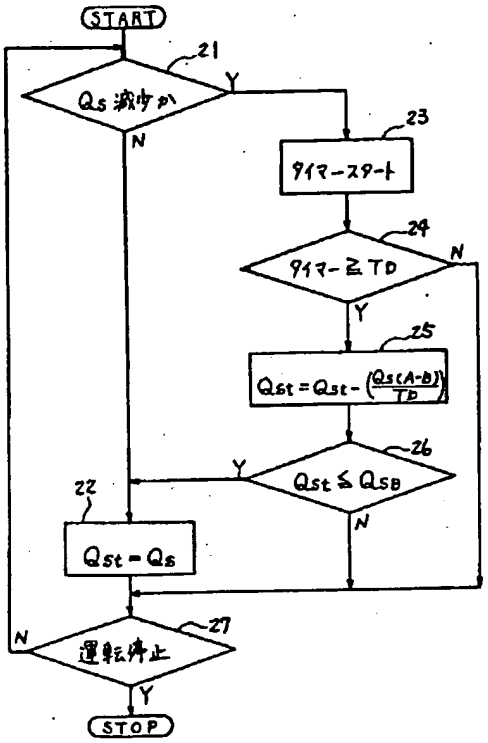
CLAIMS

[Claim(s)]
[Claim 1] The original fuel-flow control unit of the fuel cell power plant characterized by providing the following. the original fuel supplied from the supply system of original fuel -- hydrogen -- the flowmeter formed in the supply system of the aforementioned field fuel of the fuel reformer reformed to rich fuel gas, and the fuel cell power plant which has the fuel cell generated in response to the aforementioned fuel gas, and a control bulb The current detector formed in the output side of the aforementioned fuel cell. Flow rate operation part which calculates and outputs the flow rate set point of the aforementioned field fuel which ****ed in the detection value of this current detector. In the original fuel-flow control unit which consists of the valve-control section which controls the opening of the aforementioned control bulb so that the detection flow rate of the aforementioned flowmeter may be in agreement with the flow rate set point of the aforementioned field fuel, and controls the amount of supply of the aforementioned field fuel according to the output current of the aforementioned fuel cell A change speed limit means to distinguish the change in the output-flow-rate set point of the aforementioned flow rate operation part, to output the amendment flow rate set point which eased the reduction speed at the time of rapid decrease of the flow rate set point, and to output the flow rate set point which is not slowed down as it is at the time of the increase in the aforementioned flow rate set point.

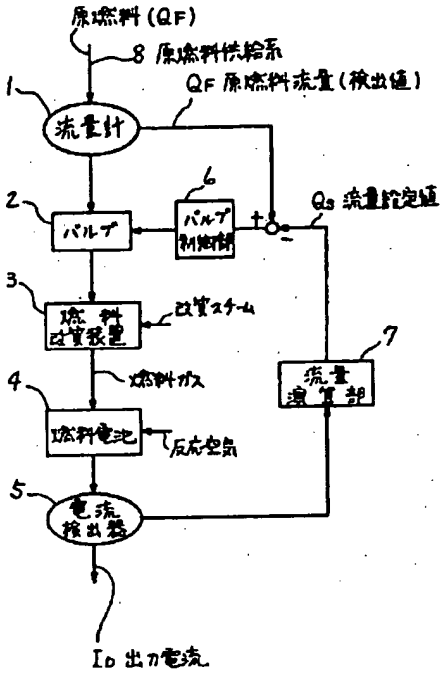
[Claim 2] The original fuel-flow control unit of the fuel cell power plant according to claim 1 characterized by providing the following. Increase-and-decrease the section of distinction from which a change speed limit means distinguishes an increase or reduction of the flow rate set point. The output section of the increase set point in a flow rate which outputs the flow rate set point which is not operated and slowed down when this increase-and-decrease section of distinction detects the increase in the flow rate set point as it is. The reduction speed reduction section which outputs the amendment flow rate set point which operated when the aforementioned increase-and-decrease section of distinction detected rapid decrease of the flow rate set point, and eased reduction speed.

[Translation done.]

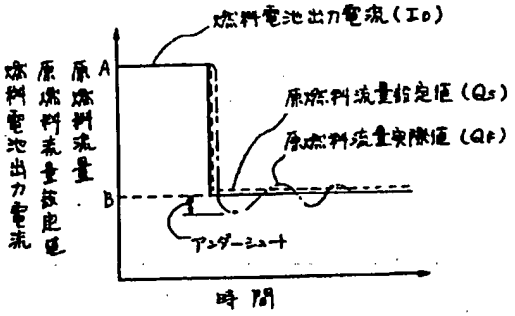
【図4】


START
21
Qs 減少か
Y
N
23
タイマースタート
24
タイマー≧TD
N
Y
25
Qst = Qst - (Qs(A-B)/TD)
26
Qst ≦ QsB
Y
N
22
Qst = Qs
27
運転停止
N
Y
STOP

【図5】


原燃料(QF)
8 原燃料供給系
QF 原燃料流量(検出値)
1
流量計
2
バルブ
6
バルブ制御部
Qs 流量設定値
3
燃料改質装置
改質スチーム
7
流量演算部
4
燃料ガス
燃料電池
反応空気
5
電流検出器
IO 出力電流

【図6】


燃料電池出力電流(IO)
原燃料流量
燃料電池出力電流
原燃料流量設定値
A
B
原燃料流量設定値(Qs)
原燃料流量実際値(Qf)
アンダーシュート
時間

* NOTICES *

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[The technical field to which invention belongs] This invention relates to the control unit of a original fuel flow to the fuel reformer in a fuel cell power plant.
[0002]
[Description of the Prior Art] Drawing 5 is the system configuration view simplifying and showing the conventional original fuel-flow control unit of a fuel cell power plant. drawing -- setting -- the fuel reformer 3 -- the mixed gas of original fuel, such as natural gas, and reforming steam -- steam reforming -- hydrogen -- it reforms to rich fuel gas and a fuel cell 4 is supplied A fuel cell 4 outputs a direct current by power generation based on the electrochemical reaction of the fuel gas supplied to the fuel electrode, and the reaction air supplied to an air pole. Thus, the original fuel-flow control unit of the constituted fuel cell power plant The flowmeter 1 and the control bulb 2 which were prepared in the original fuel-supply system 8, and the current detector 5 formed in the output side of a fuel cell 4, The fuel cell output current ID detected with the current detector 5 The flow rate set point QS of the original fuel which ****ed Flow rate operation part 7 calculated and outputted, The original fuel flow QF detected with the flowmeter is the flow rate set point QS of original fuel. It consists of the valve-control sections 6 which control the opening of the control bulb 2 so that it may follow, and it is the output current ID of a fuel cell 4. It follows and is the amount of supply QF of original fuel. It is constituted so that it may control.
[0003] By the way, the output current ID of a fuel cell 4 Although the method which controls the power converter which is not illustrated by external load instructions is used, control It is the output current ID by external load instructions. When ordered in rapid increase, a fuel cell 1 is the output current ID without retardation. As opposed to increasing rapidly Since movement of the matter and the response of the fuel reformer 3 accompanied by a chemical reaction are slow, delay arises in supply of fuel gas, and the insufficient state (lack-of-gasoline state) of fuel gas occurs transitionally in a fuel cell 4. Moreover, when a fuel cell is operated in this state, the degradation phenomenon of an electrode catalyst particle making it big and rough occurs, and the problem that this causes the fall of the power generation performance of a fuel cell and a life property owing to occurs.
[0004] In order to prevent such a degradation phenomenon, a linear expression is used for the flow rate operation part 7 in the conventional original fuel-flow control unit, and it is the flow rate set point QS of original fuel. Fuel cell output current ID By conforming to change and making it change, it is the fuel cell output current ID. Rapid increase is followed and it is a original fuel flow QF. It is constituted so that it may change. Moreover, the fuel cell output current ID It is the original fuel-flow set point QS so that fuel gas may not run short, when it increases rapidly. In adding the amendment which increases beforehand ****, it is the fuel cell output current ID. The proposal which establishes a means to make it fall quickly is proposed by the same applicant as this application etc. (refer to Japanese Patent Application No. No. 99397 [six to]).
[0005]
[Problem(s) to be Solved by the Invention] Drawing 6 is the ultimate-lines view in which, and showing it. [operation at the time of the output current rapid decrease in the conventional original fuel-flow control unit shown in drawing 5] [**] [type] It sets to drawing and is the fuel cell output current ID. The flow rate set point QS of the original fuel which the flow rate operation part 7 will output in proportion to this if it decreases rapidly on B level from A level The valve-control section 6 which decreased rapidly and detected this change is detection flow Q [of a flowmeter] F. The flow rate set point QS of original fuel The instructions which control the opening of the control bulb 2 to follow are emitted. However, operation of the control bulb 2 is the flow rate set point QS. Since rapid decrease cannot be followed, it is a original fuel flow QF. Undershoot occurred, and since a lack-of-gasoline state arose transitionally in a fuel cell 4 owing to this, with the conventional technology in_which of the fall of the degradation phenomenon of an electrode catalyst particle making it big and rough and the life property of a fuel cell is completely nonavoidable, it became clear that there is a trouble which is not noticed.
[0006] The technical problem of this invention prevents the undershoot of a original fuel flow at the time of rapid decrease of the fuel cell output current, and is to offer the original fuel-flow control unit which can avoid generating of a lack-of-gasoline state.
[0007]
[Means for Solving the Problem] In order to solve the above-mentioned technical problem, invention according to claim 1 the original fuel supplied from the supply system of original fuel -- hydrogen -- with the flowmeter and control bulb which were prepared in the supply system of the aforementioned field fuel of the fuel reformer reformed to rich fuel gas, and the fuel cell power plant which has the fuel cell generated in response to the aforementioned fuel gas The current detector formed in the output

side of the aforementioned fuel cell, and the flow rate operation part which calculates and outputs the flow rate set point of the aforementioned field fuel which ****ed in the detection value of this current detector, In the original fuel-flow control unit which consists of the valve-control section which controls the opening of the aforementioned control bulb so that the detection flow rate of the aforementioned flowmeter may be in agreement with the flow rate set point of the aforementioned field fuel, and controls the amount of supply of the aforementioned field fuel according to the output current of the aforementioned fuel cell The change in the output-flow-rate set point of the aforementioned flow rate operation part is distinguished, the amendment flow rate set point which eased the reduction speed is outputted at the time of rapid decrease of the flow rate set point, and it has a change speed limit means to output the flow rate set point which is not slowed down as it is, at the time of the increase in the aforementioned flow rate set point.

[0008] Invention according to claim 2 is set here to the original fuel-flow control unit of a fuel cell power plant according to claim 1. Increase-and-decrease the section of distinction which distinguishes an increase or reduction of the flow rate set point for a change speed limit means, The output section of the increase set point in a flow rate which outputs the flow rate set point which is not operated and slowed down when this increase-and-decrease section of distinction detects rapid increase of the flow rate set point as it is, They are good facilities when it constitutes so that it may have the reduction speed reduction section which outputs the amendment flow rate set point which operated when the aforementioned increase-and-decrease section of distinction detected rapid decrease of the flow rate set point, and eased reduction speed.

[0009] In invention according to claim 1, since a change speed limit means outputs the amendment flow rate set point which eased the reduction speed at the time of rapid decrease of the output-flow-rate set point of flow rate operation part, when it eases the reduction speed to the grade which control valve operation can follow, for example, it becomes possible to prevent the undershoot of a original fuel flow, and the lack-of-gasoline state which the undershoot of a original fuel flow generates in a fuel cell owing to is avoided. Moreover, since the flow rate set point which a change speed limit means does not slow down is outputted as it is at the time of the increase in the flow rate set point, it becomes possible to make a original fuel flow increase rapidly in proportion to the flow rate set point, and the operation which prevents lack of gasoline is obtained.

[0010] When increase-and-decrease the section of distinction detects rapid increase of the flow rate set point by invention according to claim 2 here, Since the flow rate set point which the output section of the increase set point in a flow rate does not operate and slow down is outputted as it is, and the amendment flow rate set point which the reduction speed reduction section operated and eased reduction speed is outputted when increase-and-decrease the section of distinction detects rapid decrease of the flow rate set point The operation which prevents the undershoot of a original fuel flow, and the operation which makes a original fuel flow follow and increase rapidly to the flow rate set point are obtained easily.

[0011]

[Embodiments of the Invention] This invention is explained based on an example below. In addition, since the member which attached the same reference mark as the conventional example has the same function as it of the conventional example, the explanation is omitted. Drawing 1 is the system configuration view which the original fuel-flow control unit of a fuel cell power plant in which one example of invention according to claim 1 is shown simplified. It is the fuel cell output current ID which detected the original fuel-flow control unit with the current detector 5 in drawing. The flow rate set point QS of the original fuel which ****ed It calculates, the output side of the flow rate operation part 7 to output is equipped with the change speed limit means 10, and it is the flow rate set point QS. At the time of rapid decrease, the amendment flow rate set point QSt which eased the reduction speed is outputted, and it is the flow rate set point QS. The flow rate set point QS which is not slowed down at the time of an increase therefore, original fuel flow QF which became a problem with the conventional technology by easing the reduction speed of the amendment flow rate set point QSt to the grade which operation of a control valve 2 can follow It becomes possible to prevent undershoot and the lack-of-gasoline state which the undershoot of a original fuel flow boils fuel cell 4 owing to, and generates is avoided. Moreover, the flow rate set point QS The flow rate set point QS which the change speed limit means 10 does not slow down at the time of an increase Since it outputs as it is, it is a original fuel flow QF. Flow rate set point QS And the fuel cell output current ID Opening control of the control valve 2 made to increase rapidly in proportion to change is attained, and it becomes possible to also prevent the lack-of-gasoline state at the time of output current rapid increase.

[0012] Drawing 2 is the block diagram which the change speed limit means which shows one example of invention according to claim 2 simplified. It is the flow rate set point QS to which the flow rate operation part 7 outputs a change speed limit means in drawing. The increase-and-decrease section 11 of distinction which distinguishes an increase or reduction, The flow rate set point QS which operates with the signal with which this the increase-and-decrease section 11 of distinction detects and outputs rapid increase of the flow rate set point, and is not slowed down The output section 12 of the increase set point in a flow rate outputted as it is, It consists of the reduction speed reduction sections 13 which output the amendment flow rate set point QSt which operated with the signal with which the increase-and-decrease section 11 of distinction detects and outputs rapid decrease of the flow rate set point, and eased reduction speed.

[0013] Drawing 3 is the ultimate-lines view in which, and showing it. [operation of the reduction speed reduction section in the example shown in drawing 2] [**] [type] It sets to drawing and the flow rate operation part 7 is the fuel cell output current ID. It is assumed that the flow rate set point QS (A-B) which detects rapid decrease and decreases rapidly from QSA to QSB was outputted. At this time, the reduction speed reduction section 13 is the relaxation time TD decided by speed of a control valve 2 which can be followed in the flow rate set point QS (A-B). The amendment flow rate set point QSt which falls at the reduction speed which **(ed) is outputted. The valve-control section 6 which received this is the original fuel flow QF detected with the flowmeter. Since the opening of the control bulb 2 is controlled to follow the amendment flow rate set point QSt of original fuel

Original fuel flow QF Undershoot is eliminated, the lack-of-gasoline state of the fuel cell 4 resulting from this is avoided, and bad influences, such as generating of the degradation phenomenon of an electrode catalyst particle making it big and rough and a fall of the life property of a fuel cell, are eliminated.

[0014] Drawing 4 is the flow chart showing the example from which invention according to claim 2 differs, and has shown the case where a change speed limit means is constituted as a data-processing circuit to the example. The flow rate set point QS which the flow rate operation part 7 outputs at Step 21 in drawing When not pointing to rapid decrease of a flow rate, it is the flow rate set point QS by Step 22. The equal amendment flow rate set point QSt which is not slowed down is outputted. Flow rate set point QS When rapid decrease of a flow rate is directed, a timer starts a count at Step 23, and they are the reduction speed QS (A-B)/TD at Step 25. The amendment flow rate set point QSt which decreases is outputted, and they are QSt>=QSB or timer <=TD. The amendment flow rate set point QSt is updated until it reaches conditions.

[0015]

[Effect of the Invention] When the flow rate set point which the flow rate operation part of original fuel outputs decreased rapidly as mentioned above, this invention was constituted so that a change speed limit means to ease and output the reduction speed might be established. Consequently, since the lack-of-gasoline state which the undershoot of the original fuel flow which became a problem with the conventional original fuel-flow control unit is eliminated, originates in this undershoot, and is generated in a fuel cell is avoided, the fuel cell power plant equipped with the original fuel-flow control unit which can eliminate the fall of the power generation performance which originates in a lack-of-gasoline state and is produced in a fuel cell, or a life property can be offered.

[Translation done.]

WEST

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L6: Entry 8 of 24 File: DWPI Oct 14, 1997

DERWENT-ACC-NO: 1997-556626
DERWENT-WEEK: 199751

TITLE: Fuel flow rate controller for fuel battery in power plant - has operation unit which sets fuel flow rate, variation in flow rate setting of which is corrected with low/high velocity setting by limitation unit

PATENT-ASSIGNEE:

ASSIGNEE	CODE
FUJI ELECTRIC CO LTD	FJIE

PRIORITY-DATA: 1996JP-0078622 (April 1, 1996)

PATENT-FAMILY:

PUB-NO	PUB-DATE	LANGUAGE	PAGES	MAIN-IPC
JP 09270265 A	October 14, 1997		005	H01M008/04

APPLICATION-DATA:

PUB-NO	APPL-DATE	APPL-NO	DESCRIPTOR
JP 09270265A	April 1, 1996	1996JP-0078622	

INT-CL (IPC): H01 M 8/04

ABSTRACTED-PUB-NO: JP 09270265A
BASIC-ABSTRACT:

The controller consists of a fuel reformer (3) which performs reform of original fuel supplied from the supply unit to hydrogen rich heating gas. A control valve (2) is provided in the supply part (8). A flow meter (1) which measures the flow rate of fuel in a fuel battery (4). A detector (5) provided outside the fuel battery detects the output current of battery. An operation unit (7) performs operation of rate flow setting corresponding to output current detected by the detector. A controller (6) controls the operation of the control valve so that the detected flow rate is in agreement with the set flow rate. The amount of original fuel supply is controlled based on output of detector. The variation in output flow rate of operation unit is distinguished. If there is decrease in flow rate setting, correct flow rate setting with reduced velocity is output. If there is increase in flow rate setting, the setting is corrected with enhanced flow velocity by a velocity limiting unit (10).

ADVANTAGE - Eliminates variation of original fuel rate with set rate. Eliminates reduction of electrical property. Improves life characteristic. Avoids generation of insufficient gasoline state of battery.

CHOSEN-DRAWING: Dwg.1/6

TITLE-TERMS: FUEL FLOW RATE CONTROL FUEL BATTERY POWER PLANT OPERATE UNIT SET FUEL FLOW RATE VARIATION FLOW RATE SET CORRECT LOW HIGH VELOCITY SET LIMIT UNIT

DERWENT-CLASS: X16

EPI-CODES: X16-C09;

SECONDARY-ACC-NO:
Non-CPI Secondary Accession Numbers: N1997-463914